Chemical & Engineering NEWS

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Chemical & Engineering NEWS

Cover: Ethylene glycol plant's distillation column arrives by barge at Beaumont, Tex., from Guayanilla, P.R. PPG Industries and Du Pont jointly are rebuilding the unit for 1983 production

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- ***New artificial heart,*** *implanted in a human for the first time, is made of a durable plastic that is blood compatible.* ***Page 7***
- ***New research ideas*** *that could lead to significant technical innovation are being solicited for funding by DOE.* ***Page 7***
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- ***The 1983 Pittsburgh Conference*** *& Exposition on Analytical Chemistry & Applied Spectroscopy opens March 7th in Atlantic City with more than 980 papers and almost 600 exhibitors.* ***Page 47***

BATTELLE PREDICTS 8% RISE IN R&D FUNDING

Expenditures for research and development in the U.S. will reach $83.6 billion in 1983, Battelle Columbus Laboratories says in its annual R&D forecast. According to Battelle economists Jules J. Duga and W. Halder Fisher, that amount represents an 8.2% increase from the $77.3 billion that the National Science Foundation estimates actually was to be spent for R&D in 1982.

More than half the increase will be absorbed by inflation, which Battelle estimates at 4.5% (for R&D) in 1983. Real growth in R&D will be about 3.5%, slightly higher than the average annual 3.3% increase for the past nine years.

Funding and performance patterns won't change much from previous years. However, for the second year in a row, industry R&D funding will exceed government support. Industry is expected to provide $41.4 billion, a 7.6% increase from 1982 and 49.6% of the 1983 total. The federal government is expected to provide $39.3 billion, an 8.8% increase from this year and 47.0% of the total. The rest will come from academic institutions ($1.8 billion, 2.1% of the total) and other not-for-profit organizations ($1.1 billion, 1.3% of the total).

Industry will continue to do most of the work. In 1983, Battelle says, R&D performance by industry is expected to come to $60.7 billion, or 72.5% of the total. In-house federal research will amount to $10.8 billion (13.0%). R&D by academic institutions will account for $9.7 billion (11.6%) and R&D performed by other not-for-profit organizations will come to $2.4 billion (2.9%).

Federal funds support R&D performance in all four sectors, Battelle notes. About 25% goes for in-house work; almost 50% goes to industry; about 20% goes to colleges and universities; the rest, about 5%, goes to other not-for-profit organizations.

According to the forecast, four government agencies will account for 91.2% of total federal R&D funding in 1983: the Department of Defense (56.6%), the National Aeronautics & Space Administration (14.9%), the Department of Energy (10.4%), and the Department of Health & Human Services (9.3%).

Battelle says that increases in defense R&D spending are related primarily to the acquisition of major weapons systems. However, budgets also increased for space and general science programs. Space research has received a boost from the success of the space shuttle program. The potential use of the shuttle for economical orbital insertion and repair of satellites is seen as justifying continued support, the forecast notes.

However, funds for energy R&D will continue to decline, Battelle says, "since there is little evidence that energy will be perceived as a national problem requiring massive federal R&D support." Also, "less emphasis will be placed on 'soft' sciences, except those environmental, ecological, and socioeconomic investigations presently mandated by law."

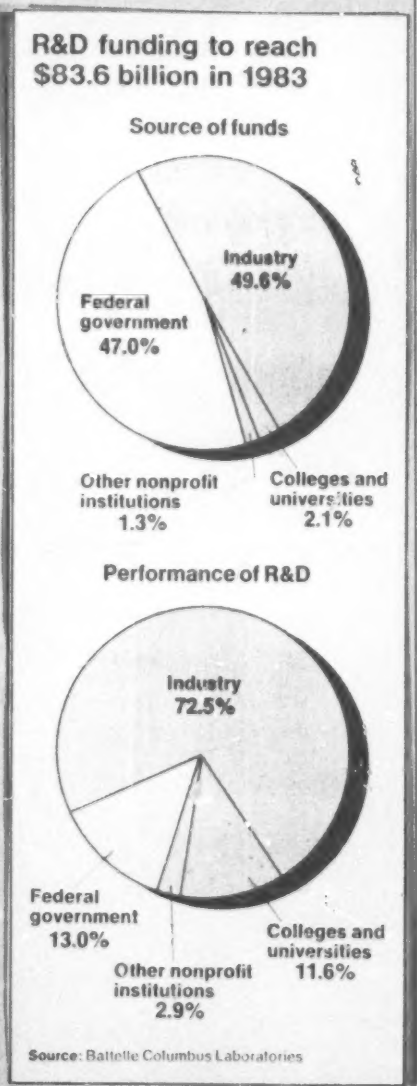
R&D will be heavily self-funded in the manufacturing industries, Battelle says, with, on average, only 32.2% of the total ($58.6 billion) coming from the federal government. In 1983, electrical machinery and communications will displace aerospace as the largest single sector of industrial R&D, with total funding close to $12.9 billion, 40.9% of which will come from the federal government. Total funds for aerospace R&D will amount to $11.8 billion, with about 80% of that amount coming from the federal government.

Other major sectors of industrial R&D include machinery ($9.05 billion total, 16.7% federally funded); autos, trucks, parts, and other transportation equipment ($7.19 billion, 14.4%); chemicals ($6.83 billion, 10.0%); professional and scientific instruments ($3.43 billion, 6.4%); and petroleum products ($2.47 billion, 12.5%).

Nonmanufacturing industries do relatively little R&D—only about $2.02 billion total in 1983, according to the forecast. Support for those activities will be divided almost equally between industry and the federal government.

In general, Battelle says, industry is taking over short-term R&D projects. It also is reacting to growing pressure from foreign technological competition. The forecast warns, however, that industry R&D commitments tend to lag a year behind cash flows.

Battelle also notes that, during the past few years, federal support has shifted toward more development and away from basic and applied research. If that trend continues, "the long-range consequences may pose significant problems in terms of the science base upon which economic vitality grows." That problem may be mitigated by a continuation of the recent resurgence of basic research support by industry. However, adds Battelle, the volatility of indicators that affect industrial R&D budgets—such as sales, profits, and cash flows—precludes stability for long-term planning. □



Chemical capital spending continues down

Budget plans for plants and equipment for major U.S. chemical companies fall again for 1983; economy is blamed

William J. Storck
C&EN, New York

Capital spending among U.S. chemical companies is having its own recession. Outlays are down 10.5% in 1982 from last year's level and will drop another 9.3% next year, according to C&EN's annual survey of leading U.S. chemical companies.

These declines are by far the biggest in at least 20 years. They confirm the universal impression that the chemical industry's investment in new plant and equipment—the largest use of company funds after ordinary running expenses and taxes—is in very weak shape. An upsurge in spending is nowhere in sight.

The trough in capital spending has weighty implications. It means, for example, continued poor prospects for engineering firms and the engineering job market and a continued pinch on cash flow for chemical companies.

It is no wonder that capital spending in the industry has dropped. Some may even wonder that it hasn't fallen more. The reasons for the drop are simple: Earnings have plummeted as demand for chemicals, both in the U.S. and overseas, has fallen. Thus, return on investment at most chemical companies is down to the point where it is near or below reinvestment levels.

Few companies, if any, have reason to build plants. With reduced demand in 1982, practically 40% of the nation's chemical-producing capacity is lying idle. With this idle capacity and the outlook for only modest recovery next year, it may be 1984 or beyond before spending for new plant and equipment gets back to respectable levels.

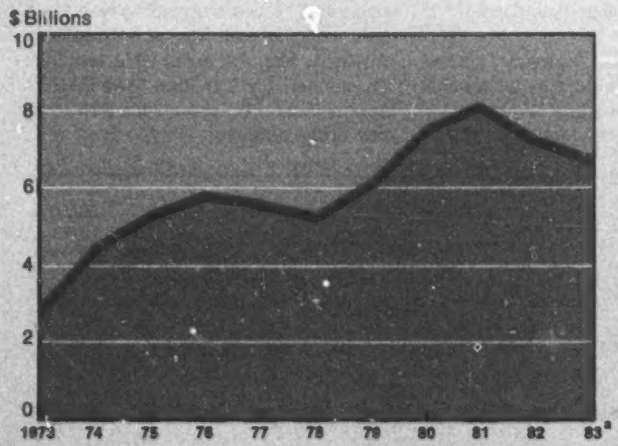
The problems of capital spending are not confined to the chemical industry. Chase Econometrics says that investment spending in general will remain sluggish because of low operating rates and sharp declines in corporate profits. These are offsetting, according to the consulting firm, the favorable effect of recently enacted investment incentives. Chase Econometrics does not believe that investment will start to pick up until late 1983 when the general economy improves.

Charles Reeder, Du Pont's chief economist, says that despite favorable

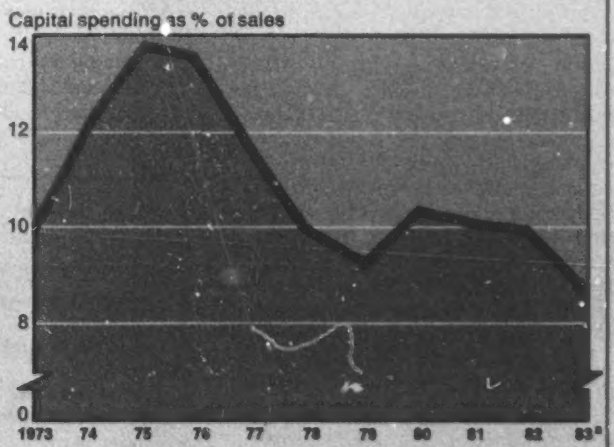
Outlays for new plant and equipment are down 10.5% in 1982 from last year

forecasts for some parts of the economy, the growth of total economic activity will be held down in 1983 by weakness in business capital spending and by net exports. He says that outlays on a constant dollar basis for new plants and equipment are de-

Capital spending will fall once more in 1983 for U.S. chemical industry...



...and will continue weak as a percentage of chemical sales



a C&EN estimate. Source: Combined data from major chemical companies

Capital spending in 1982 shows biggest drop in years

$ Millions	1983 Worldwide	1983 U.S.	1982 Worldwide	1982 U.S.	Worldwide 1982 Planned[a]	Worldwide 1981	Worldwide 1980	Worldwide 1979	Worldwide 1978	Change from previous year 1983	Change from previous year 1982
Air Products	$ 275	$ 234	$ 347	$ 302	$ 400	$ 323	$ 364	$ 246	$ 200	−20.7%	7.4%
Allied	na	na	600	420	700	609	533	409	502	—	−1.4
American Cyanamid	na	na	180	126	185	181	196	235	251	—	−0.6
Celanese	248[b]	169[b]	275	187	400	414	253	245	248	−10.0	−31.3
Diamond Shamrock	360	324	540	486	540	521	387	266	319	−33.3	3.6
Dow Chemical	750	450	850	510	1000	1176	1184	1268	1075	−11.8	−27.7
Du Pont[c]	1358[b]	1154	1400	1190	1400	1500	1297	884	714	−3.0	−6.7
Ethyl	100	90	85	75	120	141	156	123	96	17.6	−39.7
W. R. Grace	495[b]	446[b]	625	558	800	685	658	514	313	−20.8	−6.0
Hercules	200	160	165	132	180	167	229	186	116	21.2	−1.2
Monsanto	700	616	615	541	660	668	781	566	480	13.8	−7.9
Olin	143[b]	135[b]	143	135	160[b]	186	172	161	163	0	−23.1
Rohm & Haas	135[b]	108[b]	125	100	na	182	93	68	66	8.0	−31.3
Stauffer Chemical	205[b]	195[b]	205[b]	195[b]	215	239	246	239	201	0	−14.2
Union Carbide	950[b]	627[b]	1150	805	1300	1186	1129	831	688	−17.4	−3.0
TOTAL FOR 15 FIRMS[d]	$5919	$4708	$7305	$5762	$8060	$8158	$7650	$6141	$5362		
ANNUAL CHANGE[d]	−9.3%	−9.7%	−10.5%	−8.7%	−1%	7%	25%	15%	−5%		

a Earliest estimate. b C&EN estimate. c Excludes Conoco. d 1983 excludes Allied and American Cyanamid. na = not available.

clining sharply now and this situation will continue through most of next year, no matter how low interest rates fall. Part of the decline is linked to reduced investment in the energy area and part reflects low capacity utilization rates for manufacturers. According to Reeder, several quarters of strong business activity will be required before a turnaround in capital expenditures even can be considered.

Undoubtedly, what is true for the general economy also is true for the chemical industry in this instance. As the economy drags and as the industry matures, it may be a long time before chemical companies experience the 25% annual increase in capital spending they did in 1980 or even the 15% rise in 1979.

In 1982, capital expenditures among the 15 leading chemical companies surveyed by C&EN will fall about 10.5% from 1981 to $7.31 billion. The downward adjustment of spending during the year from what was originally forecast by the chemical companies is quite indicative of a deepening recession. The 15 firms originally had forecast that capital spending in 1982 would be down 1.2% from 1981 to $8.06 billion. However, as the year progressed, budgets were revised until actual spending will come in at about 9.4% below the original forecast. It is not unknown for actual spending to come in below the first optimistic forecasts, but a change this great is unusual.

Among the companies surveyed,

West German spending in the U.S. will be flat

One of the largest blocks of chemical capital spending in the U.S. controlled from abroad is from West Germany. Capital spending in the U.S. by the three largest West German chemical companies, unlike their U.S. counterparts, will be down only slightly—less than 1%—in 1983. However, one company's spending will be down considerably, one up substantially, and one will be flat.

Combined capital spending in the U.S. among the three will total about $361 million, a decline of just 0.8% from 1982. However, only BASF North America reflects the general picture. It is planning to hold its capital spending flat at $160 million in 1983. This is the same as it says that it will spend in 1982.

On the down side, however, American Hoechst, the U.S. arm of Hoechst A.G., plans to spend just $71 million in 1983, off 22% from this year. Mobay and other Bayer-owned U.S. subsidiaries plan to spend $130 million in the U.S. next year, up 15% from 1982.

The spending decline for 1982 from the year before, among the three companies, far outpaced that for U.S. chemical companies and there were big drops for all of the companies. Spending among the three totaled $364 million in 1982, down 33.6% from 1981.

By far, the worst case was Mobay, whose outlays dropped 54.4% from 1981 to $113 million. BASF was second with a 20% drop to $160 million, and American Hoechst's spending dropped 9% to $91 million.

For 1982, all three of the companies came in below original budgeted capital spending. Mobay's spending was 27% below original estimates of $155 million. American Hoechst spent 23% less than its planned $118 million. And BASF's spending fell 20% below the $200 million first estimated.

U.S. subsidiary (parent)	Capital spending in U.S. ($ millions) 1983[a]	1982	1981	1980	1979	1978	Change 1982–83	Average annual change 1978–82
American Hoechst (Hoechst)	$ 71	$ 91	$100	$100	$189	$105	−22%	−4%
BASF North America (BASF)	160	160	200	200	136	118	—	8
Mobay and other subsidiaries (Bayer)	130	113	248	220	150	119	15	2

a C&EN estimate.

the largest year-to-year drop in capital expenditures was at Ethyl, where spending in 1982 will be about $85 million. This is 39.7% below 1981 spending.

Two other companies—Rohm & Haas and Celanese—spent more than 30% less in 1982 than in the previous year. At Rohm & Haas, capital spending in 1982 was $125 million, a 31.3% decrease from 1981. Celanese spending dropped 31.3%, too, to $275 million.

The biggest dollar-volume drop was for Dow Chemical, whose capital spending in 1982 will total about $850 million, off 27.7% from 1981.

Only two companies increased their capital spending this year. Air Products' spending on new plant and equipment for its fiscal year ended Sept. 30 rose 7.4% from fiscal 1981 to $347 million. And Diamond Shamrock's capital spending this year will increase a modest 3.6% to $540 million.

For next year, chemical capital spending continues to look bleak. C&EN's survey shows that chemical companies will spend about 9.3% less on new plants and equipment than they did in 1982.

Some companies are planning big cuts. For example, Air Products, which had a 7.4% increase in 1982, says that capital spending in 1983 will be about 20.7% lower, at $275 million, than this year's $347 million.

Diamond Shamrock, the other company with an increase in 1982, is planning a spending cut of 33.3% in 1983 to about $360 million.

Preliminary estimates are that W. R. Grace will cut its capital budget by about 21% with spending of less than $500 million next year. Union Carbide will spend about $950 million next year, based on preliminary estimates, down 17.4% from this year. Other companies cutting their budgets next year include Celanese, Dow Chemical, and Du Pont.

If it is not just an initial flash of optimism, there are some companies that are planning hefty increases in capital spending in 1983. For instance, Hercules has budgeted to spend about $200 million, up 21.2% from 1982. Ethyl says that its capital budget will be about $100 million, up 17.6% from 1982. Monsanto will spend $700 million next year, an increase of 13.8% from this year. And Rohm & Haas says that spending will be up, but doesn't indicate by how much. C&EN estimates that spending at the Philadelphia-based company will be 8% above 1982's $125 million.

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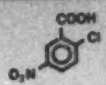
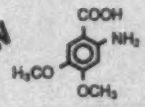


2-Chloro-5-nitrobenzoic acid

4-Nitroethylbenzene

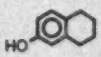
NEW



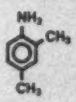
2-Amino-4,5-dimethoxybenzoic acid
(6-Aminoveratric acid)

2,3-Benzofuran
Coumarone

NEW



6-Hydroxytetralin



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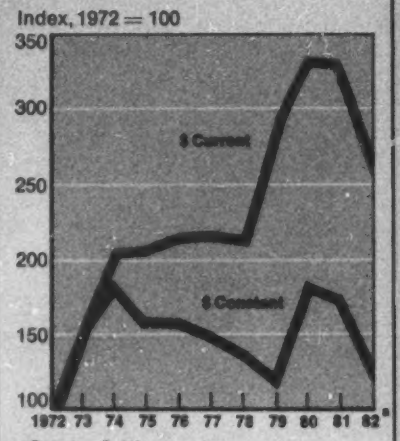
Capital appropriations have plummeted



[a] Based on first three quarters.
Source: Conference Board

Most of the companies say that U.S. spending will take about the same percentage of total capital spending next year as it did this year. Combined capital spending overseas will be about $1.20 billion for 13 of the 15 companies this year, compared with about $1.31 billion in 1982. This is about 21% of worldwide spending for both years.

C&EN's finding in its survey that future capital spending will decline is supported in part by the Conference Board, except the New York City-based business group's figures are even more dismal. In its third-quarter report on capital appropriations (monies to be spent in the future), the Conference Board found that through the first three quarters of 1982, appropriations for the broad category chemicals and allied products fell 26.5% from the first nine months of 1981 to $6.88 billion. The third quarter alone was even worse, with appropriations dropping 29.7% to $2.38 billion.

On a constant-dollar basis, the picture is even worse. For the first three quarters this year, appropriations, expressed in 1972 dollars, have dropped 30% from the first nine months of 1981 to $3.46 billion. Third-quarter appropriations are down 32.3%, falling to $1.19 billion. On an annualized basis, it looks like 1982 will be the worst year for constant-dollar appropriations since 1972.

Thus, if the Conference Board's figures are correct, the pundits are correct and capital spending is going to stay depressed for some time to come. □

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